EXHIBIT 1

October 26, 1932 letter to Director of Irrigation, U.S. Indian Service, from C.A. Engle and Report: "Water Available Under Special Master's Recommended Decree and Its Utilization"

UNITED STATES

DEPARTMENT OF THE INTERIOR

OFFICE OF INDIAN AFFAIRS

IRRIGATION SERVICE

Oct. 26, 1932

Director of Irrigation,
U. S. Indian Service,
Washington, D. C.

Dear Sir:

Herewith is submitted a report concerning conditions on the Walker River Indian Reservation, wherein is discussed the subject, "Water Available Under The Proposed Decree and Its Utilization". Preliminary plans and cost estimates for various types of storage dam at the Weber site are included.

Very respectfully yours,

C. A. Engle

EXHIBIT 1

Walker River Indian Reservation - Nevada

WATER AVAILABLE UNDER SPECIAL MASTER'S RECOMMENDED DECREE AND ITS UTILIZATION

Location, Area, Irrigable & Irrigated Acreage.- The Walker River Indian Reservation in western Nevada embraces a tract of land 2 to 5 miles wide, and extending from Walker Lake northwesterly along Walker River for a distance of about 27 miles. The total area is 85,760 acres, of which 10,000 acres are classed as irrigable, and about 1,400 to 2,000 acres are usually irrigated by the Indians with the inadequate and uncertain water supply available.

Reservation Established.- The reservation was set aside in 1859.

White Settlers Deprive Indians of Water.- Shortly after this area was set aside for the Indians, white settlers established themselves at various places along the river above the reservation. As early as 1898,- as the result of both the constantly increasing acreage irrigated above the reservation, and the extreme seasonal fluctuations of stream flow, due in part to grazing and destruction of forest cover,- the water supply available for the Indians was inadequate and uncertain, and frequently no water whatever was available for irrigation during the latter half of the season. In a report of July 22, 1899, T. A. Ellis states that the Indians were then cultivating 1,300 acres; that "last year we had no water for irrigation after about the 10th of July, * * our grain crops were cut short about 40% * * * while our vegetable crop was an entire failure"; and strongly urges the construction of a storage reservoir.

Adjudication Proceedings for Determination of Indian Rights.- Finally, as the result of an acute water shortage in the summer of 1924, when no water was available for the Indians after June 10, legal proceedings were initiated by the Department of Justice in the Federal Court, at the instance of the Department of the Interior, to determine the water rights of the United States for the use of the Indians. In the Bill of Complaint, a right of first priority, dating from the date of the establishment of the reservation (1859) was requested for 150 second feet for the irrigation of 10,000 acres. In his recent report - dated February 1932, the Special Master recommends to the court that there be decreed 25.21 second feet during the irrigation season of 180 days, April 1 to September 27 inclusive, for the irrigation of 2,000 acres of reservation land. It is presumed this recommendation will be accepted by the court, in which case it is the expressed intention of the attorneys in charge of the government's interests to appeal the case.

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Walker River.- The most important features of the Walker River system are East Walker and West Walker Rivers which, with their tributaries drain practically all the high mountainous territory included in the Walker River basin. The main stream, or Walker River proper, from the junction of East and West Walker Rivers to Walker Lake, is about 50 miles in length; this part of the stream system drains a comparatively low, narrow area, and has no tributaries of importance.

For the period 1902 to 1931, the mean annual runoff of East Walker River near Bridgeport was 132,700 acre feet; the maximum was 299,000 in 1911; and the minimum was 27,480 in 1931. For the same period the mean annual runoff of West Walker River at Colville was 215,100 acre-feet; the maximum was 483,000 in 1907; and the minimum was 67,900 in 1924. For the same period the mean annual discharge for both East & West Walker Rivers as compiled by Paul V. Hodges, Hydrographic Engineer, is 347,800 acre feet; the maximum 763,000 in 1907; and the minimum 98,980 in 1931.

Irrigation Development; Present and Probable, Above the Reservation.- In 1926, the date of the latest reliable data available, (Blomgren's Report, p. 27, December 1926) 105,600 acres were being irrigated on the Walker River above the reservation, distributed as follows:

	Acres
Antelope Valley, West Walker River,	15,000
Smith " " " "	18,000
Bridgeport " East " "	20,000
Sweetwater " " " "	7,500
Mason Valley, Main " "	45,100
Total	105,600

At the same time 1,900 acres were being irrigated on the Indian Reservation, making the total for the entire Walker River Basin 107,500 acres. At this time (1926) there had been constructed by the Walker River Irrigation District (in 1921) the Topaz Lake Reservoir on West Walker River - capacity 50,500 acre feet and (in 1925) the Bridgeport Reservoir, on East Walker River - capacity 42,000 acre feet, or a total storage development of 92,500 acre feet. The cost of the Topaz Lake Reservoir was $423,500, and of the Bridgeport Reservoir $435,400. The Walker River Irrigation District, which embraces an area of 164,000 acres, most of which is in Mason, and Smith Valleys, also has in contemplation the construction of a reservoir at Hoye Canyon on the West Walker River, with a capacity of 130,000 acre feet at an estimated cost of $372,000.

In 1915, when the U. S. Reclamation Service had under consideration the construction of an irrigation project embracing the Walker River

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Valley, Engineer J. C. Stevens, then of that Service, on the basis of extensive preliminary surveys and investigations, proposed a project of 132,600 acres, including the following lands which he concluded could be irrigated by the then available water supply regulated by 196,000 acre feet of storage on West Walker River, and 45,000 acre feet of storage on East Walker, or a total storage of 241,000 acre feet.

	Old Lands with water rights	New Lands	Total Acres
Antelope Valley	14,200		14,200
Smith Valley	8,590	25,000	33,590
Mason Valley	43,130	31,000	74,130
Indian Resvn.	1,910	8,790	10,700
	67,830	64,790	132,620

Mr. Stevens' figures were based on a net duty at the land of 2 acre feet and a gross duty at river diversion of 3 acre feet. Mr. Stevens' assumed duty appears unattainable in practice, when it is considered that the average quantity used on the Newlands Project 1912 to 1926 was 2.80 acre feet on the land, and the amount diverted was 5.3 acre feet per acre. If anything, the Walker River Valley will require more, as the soils are more sandy.

In addition to the foregoing lands proposed to be included in the Walker River Project as contemplated by the Reclamation Service in 1915, there were then as now, about 27,500 acres being irrigated in Bridgeport, and Sweetwater Valleys on East Walker River, which are above, and thus not included in the proposed Bureau of Reclamation development. The ultimate possible economic development contemplated in the Walker River Valley by the Bureau of Reclamation was therefore about 160,000 acres, requiring 241,000 acre feet of storage. The necessity for storage on the Walker River is emphatically indicated by the fact that the average flow for August and September is sufficient only to supply 24,000 acres on the basis of .013 second feet per acre.

As pointed out by Blomgren (Report; December, 1926, p. 26) the total area reasonably susceptible of cultivation in the Walker River Basin is about 208,000 acres, (198,000 acres above the reservation) so it is entirely probable, unless future development can in some way be restricted, that the ultimate development may considerably exceed the limit suggested by the Bureau of Reclamation.

Irrigation Development on Reservation - Present and Proposed.- The existing irrigation system consists of a concrete diversion weir, and about 30 miles of canals and laterals of 5 to 75 second feet capacity, capable of serving 3,600 acres, of which 1,450 acres were irrigated in 1931. The total expenditure by the United States to June 30, 1931, for irrigation, Construction and O & M on the reservation was $237,914.34.

A storage reservoir has long been recognized as a necessity, but the absence of desirable storage sites, and the inadvisability of a large expenditure for storage in advance of the determination of water rights, has heretofore made it inexpedient or infeasible to proceed with such development.

Storage investigations on the reservation were made by Messrs. Weber and Beemer in 1918 and in 1920, on the basis of which Engineer Beemer advocated the construction of a reservoir of approximately 10,000 acre feet at the Weber site, principally because it was at that time considered the only feasible site in the reservation. In 1926 Engineers Blomgren and Kronquist, under the direction of Supervising Engineer C. A. Engle, re-examined the Weber and Parker sites, revised the cost estimates, and made extensive investigations and prepared plans for a 30,000 acre feet reservoir at the Rio Vista site, the cost of which was estimated at $300,000.

In view of the policy heretofore adopted and followed by the government, and concurred in by the Federal Courts, it has always been contemplated that the ultimate irrigation development on the reservation would include the entire irrigable area of 10,000 acres, and accordingly water for this area was claimed in the Bill of Complaint in the adjudication suit.

Special Master's Recommended Decree.- The only recommendation of the Special Master concerning the rights of the United States for the use of the Indians is embraced in the following paragraph of his report:

> "Under the facts as they appear from the evidence, it would be unjust to the United States and to the Indians upon the Reservation to subject the United States, which originally owned all the lands and the water, to the status of an appropriator; but on the other hand it would be inequitable to allocate to the United States water for ten thousand acres of land to the detriment of the upstream settlers. It appears that during the entire period since the creation of the Reservation, approximately two thousand acres of land thereof have been brought under irrigation, that there are about

five hundred Indians on the Reservation and that the number is not increasing. There is no showing that there is a substantial demand by other Indians for the irrigation of more than these two thousand acres. The United States should be granted a priority right to 25.21 cubic feet of water per second for the irrigation of two thousand acres on the Reservation."

In the "Master's Conclusions of Law" appears the following:

"The plaintiff, United States of America, is entitled to the continuous flow of 25.21 cubic feet of water per second to be diverted from Walker River upon or above Walker River Indian Reservation during the irrigation season of one hundred eighty days for the irrigation of two thousand acres of land of said Reservation with a priority of November 29, 1859, and the plaintiff is entitled to an injunction against the defendants enjoining them from preventing or interfering with the natural flow of 25.21 cubic feet of water per second in the natural channels of Walker River and its tributaries to and upon Walker River Indian Reservation."

The "Master's Proposed Decree" is as follows:

"The plaintiff, United States of America, has appropriated and is the owner and entitled to the use of 25.21 cubic feet per second of the waters of Walker River with a priority of November 29, 1859, to be diverted upon or at its option above Walker River Indian Reservation in the State and District of Nevada for use upon said Reservation and for the irrigation of the lands thereof."

"The defendants and each and every one of them, their successors in interest, their and each of their agents, servants, employees and any and all other persons whomsoever, individuals or acting with others, are enjoined from in any manner obstructing or preventing the natural flow of 25.21 cubic feet per second of the waters of Walker River and/or its tributaries from flowing down, along or through the natural channels of said river and its tributaries to and upon said Walker River Indian Reservation, subject, however, to the prior rights of Sierra Pacific Power Company, to the use of water hereinafter decreed to it."

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It is my understanding that Special Assistants to the Attorney General, Messrs. Ward and Harwood construe the Master's recommendations to contemplate the delivery of 25.21 second feet at the Indian Diversion. It is believed that this matter should be clarified, as the statement "The defendants *** are enjoined from *** preventing the natural flow of 25.21 cubic feet per second *** from flowing *** through the natural channels of said river *** to and upon said Walker River Indian Reservation" might ordinarily be construed to mean delivery at the northern or upstream boundary of the reservation. In what follows, it is inferred that it is the intention to deliver during the irrigation season 25.21 second feet at the Indian Diversion, or so much thereof as the normal, uncontrolled, or unimpaired stream flow will supply.

Estimate of Water Available Under Master's Recommendation.- It is understood that the Special Master's recommendation to the Court contemplates the delivery, exclusive of all losses, of 25.21 second feet from the normal flow of the river, at the diversion point of the Indian Reservation canals during the irrigation season of 180 days, April 1 to September 27, inclusive. During such floods as may occur during the irrigation season, any water in excess of the quantity necessary to supply the 25.21 second feet and which upstream water users cannot divert into their canals or impound in their reservoirs, will flow on down the stream and be available for use on the reservation. There is some question, however, as to whether such water in excess of the 25.21 second feet may be used only as a supplemental supply on the 2,000 acres referred to in the Master's report, or whether it may be used on additional lands. Presumably it can be used only on the 2,000 acres. This point should be submitted for clarification by the court. It is presumed also that any water reaching the Indian Reservation during the non-irrigation season will be available for storage, and for use during the irrigation season on land in addition to the 2,000 acres referred to in the Special Master's proposed decree, such storage right for flood and surplus water for the irrigation of lands in excess of 2,000 acres depending upon actual appropriation and use, and being junior to such rights already initiated and partially completed by the Walker River Irrigation District contemplating ultimate storage of 222,000 acre feet annually.

The last diversion above the Indian diversion on Walker River is at the Yerington Weir, where several of the Mason Valley Canals are diverted. The Yerington Weir is 34 miles upstream from the Indian diversion. The East Side Mason Valley Drainage Canal

flows into the river 12 miles below the Yerington Weir, and 14 miles below the Weir is the Parker gaging station. In addition to the discharge of the drainage canal, there ordinarily is considerable return flow - both surface and sub-surface - between Yerington Weir and the Parker gaging station; but in the 20 miles of river channel between the Parker station and the Indian diversion, the return flow is negligible.

From records kept in 1929, which are compiled and analyzed in his report of December 1929 (p. 19) Consulting Engineer J. C. Stevens finds that of the total inflow of 4,189 acre feet from June 11 to September 30, inclusive, "in the 19.6 mile stretch from the Parker control to the diversion dam for the reservation canals, the total loss was 1,606 acre feet or 38.4% of the supply". During this period the inflow varied from 34.7 to 5.2 second feet. With a larger and more uniform inflow the losses should be less proportionately. These records, as compiled by Mr. Stevens show that during this period (June 11 to September 30) 1134 acre feet passed the Yerington Weir. This was increased to 2,189 acre feet at Wabuska Slough (10.6 mi. below the weir) by return flow; 2,000 acre feet additional (largely from the Mason Valley Drain) was received between Wabuska Slough and the Parker control which is 14.2 miles below Yerington Weir, making a total of 4,189 acre feet at Parker. Of the 4,189 acre feet passing Parker, 2,583 acre feet reached the Indian diversion, indicating a loss of 1,606 acre feet between Parker and the Indian diversion. These quantities conform to an average flow of 5 second feet at Yerington Weir, 9.8 second feet at Wabuska Slough, 18.5 second feet at Parker and 11.5 second feet at the Indian Diversion Weir.

In July of 1924, under a stipulated agreement between government representatives and private interests, the entire flow of East and West Walker River for a period of 5 days was impounded in Bridgeport and Topaz reservoirs, and then released for use on the reservation, the releases being so timed as to meet at the confluence of the two branches. During the 5 day period, 314 acre feet were stored at Bridgeport, and 232 acre feet at Topaz. The stored water was released in large streams (150 second feet from Bridgeport) to minimize losses. Of the stored water thus released, the average flow over the Yerington Weir, which is below all diversions above the reservation, and 34 miles above the Indian Diversion, was on July 24, 15 second feet; on the 25th, 31 second feet; and on the 26th, 25 second feet. On July 26th, General Foreman Kronquist, representing the government, advised the upstream interests to take the entire flow as none of it would reach the reservation. (See Blom-

gren Report of December 1926).

As the result of stream-flow records at Parker and at the Indian Diversion for the entire season of 1929, when the quantity of water flowing in the lower Walker River approximated the quantity now recommended for the Indian Reservation by the Special Master, it was found that the loss in 8,100 acre feet in the 20 miles of river channel immediately above the Indian Diversion was approximately 2,050 acre feet, or about one-fourth of the flow. This data as compiled by Mr. Stevens in his report of December, 1929 (p. 23) is as follows:

Period		Inflow	Outflow	Loss or Gain (-) Acre feet	Loss or Gain (-) % of Inflow
1929	April	1,400	1,310	90	6
	May	1,850	1,620	230	12
	June	1,870	1,470	400	21
	July	1,940	1,270	670	34
	August	640	200	440	69
	September	400	180	220	55
	Season	8,100	6,050	2,050	25

The foregoing record indicates that a flow of about 35 second feet will be required at the south end of Mason Valley in order to supply 25.21 second feet at the Indian diversion. There are occasions during the irrigation season when the combined flow of East and West Walker Rivers is less than the 35 second feet probably required at Parker to supply 25.21 second feet at the reservation diversion. In September 1931, there were eight days when the combined discharge was less than 35 second feet, the minimum discharge being 30 second feet. When the natural stream flow decreases to 30 second feet, it is probable, because of proportionately increasing losses, that not more than 20 second feet may reach the Indian Diversion.

It is understood that the Special Master's recommended decree contemplates that water users of the upper basin shall receive credit up to the amount actually necessary at Parker to supply 25.21 second feet at the Indian Diversion, for return flow and drainage water. For example, with 13.5 second feet coming into the river as return flow and drainage water between Yerington Weir and Parker, as was the case in 1929 previously cited, only such additional amount - probably 22 second feet - as necessary to supply 25.21 second feet at the Indian Diversion would have to be passed at the Yerington Weir, so long as the total natural flow of the river equals or exceeds the amount necessary at Parker to supply the decreed flow at the reservation.

Ultimate Water Requirement of Lands Above Reservation and Return Flow.- Assuming a probable ultimate development in Walker River Valley such as that contemplated by the Bureau of Reclamation on the basis of their 1915 surveys, the net water requirement would be about as shown in the following tabulation. Return flow is computed on the basis of investigations made by Engineer Beemer in 1922 and 1923 while in the employ of the Walker River Irrigation District, and compiled in the Stevens Report of December, 1929.

West Walker River

	Ultimate Irrigable Area	Gross Demand	Return available %	Flow for use Amount	Net Demand Acre Feet	Return Flow, Lower Mason Valley
Antelope Valley	14,000	42,000	50	21,000	21,000	
Smith Valley	33,000	99,000	30	30,000	69,000	
Mason Valley	33,000	99,000	20	(20,000*)	69,000*	10,000*
	80,000	240,000		71,000	179,000	

East Walker River

Bridgeport Valley	20,000	60,000	50	30,000	30,000	
Sweetwater Valley	9,000	27,000	50	14,000	13,000	
Mason Valley	41,000	123,000	20	(25,000*	110,000*	12,000*
	70,000	210,000		69,000	158,000	
Grand Total	150,000	450,000		140,000	332,000	22,000

*In computing the net demand for Mason Valley, it is assumed that the return flow from one-half the area will be re-used, and that the return flow from the remaining area will appear in the river at the south end of the valley, and - less conveyance losses - will be available for use on the Indian Reservation.

In the foregoing set-up, Mason Valley is so divided between West and East Walker Rivers as to make the area served from each stream proportionate to the mean annual flow of each as recorded at Colville and at Bridgeport, respectively. In making this division, Bridgeport Valley is ignored, as it is above Bridgeport Station, and the flow of East Walker River as recorded is the actual flow less the consumptive use in Bridgeport Valley.

Probable Return Flow Available for Reservation.- Based on the foregoing assumptions, there would be a return flow during years of average stream flow, after Walker River Valley is fully developed, of about 20,000 acre feet annually, which, less conveyance losses,

would be available for irrigation of Indian lands. This would be equivalent to an average flow of 40 second feet. The flow would probably vary from 10 to 50 second feet. Assuming a conveyance loss of 25%, this would supply 15,000 acre feet annually at the Indian Diversion, of which that part flowing during the irrigation season would be inclusive of the decreed amount of 25.21 second feet so long as it did not exceed this flow at the Indian Diversion. Assuming that 20% of this amount would flow during the non-irrigation season, the average flow would be about 33 second feet which would probably supply the decreed amount at the Indian Diversion.

Under present conditions of development in the Walker River Valley above the reservation, it is not probable that the return-flow will ever be in excess of the flow required to maintain the recommended 25.21 second feet at the Indian Diversion, or a total for the irrigation season of 9,000 acre feet. As a matter of fact, the data available indicates that the return flow below Yerington Weir - including the discharge from the Mason Valley East Side Drain - seldom exceeds 30 second feet. The average, June 11 to September 30, inclusive (1929) was 14 second feet; the minimum 5; and the maximum 31 second feet.

Probable Flood Flows Available for Reservation.- In his Report of April 29, 1932, Hydrographic Engineer Paul V. Hodges shows in Table 2 an estimate - based on present conditions - of the quantity of water that would have been available annually under the Special Master's recommendation for the years 1920 to 1931, inclusive. The amounts vary from 15,600 to 249,000 acre feet and the mean is 69,300. These amounts are made up of the 25.21 second feet during the irrigation season plus such flood flows that occur during the year and that are in excess of the irrigation requirements and constructed storage capacities of up-stream users. No allowance is made for transmission losses.

In Table 3 of his report Mr. Hodges gives an estimate of the amount available for the same period - 1920 to 1931 - under the Master's recommendation, and assuming that the water supply in excess of the present demand will be required by future development, one-half of which it is assumed will be on the Indian Reservation, and one-half above the reservation, as explained on page 1 of the report. The estimated quantities available under this set-up vary from 15,600 to 143,000 acre feet and the mean is 51,400 acre feet. No allowance for losses.

The foregoing assumptions do not take into consideration the fact that the future development on the reservation is limited by physical conditions and by claims already set up, to 10,000 acres; and that up-stream development, long contemplated, including substantial increases in both the area irrigated and in storage facilities, will practically exhaust any excess water supply now existing for average years.

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The Walker River Irrigation District has developed 42,000 acre feet of storage at Bridgeport on East Walker River, 50,000 acre feet at Topaz on West Walker, and has in contemplation the construction of Hoye Canyon Reservoir of 130,000 acre feet on West Walker. Assuming Hoye Canyon completed, and 150,000 acres under irrigation upstream from the reservation, as indicated in the tabulation following this paragraph, but little water in excess of the decreed amount, and other than return flow from irrigation that could not be rediverted and used by upstream users, would ever reach the reservation during average years.

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Walker River-Annual Discharge and Probable Wastes and Deficiencies With Ultimate Development Above Reservation

	West Walker River			East Walker River			
	Annual Flow	In Storage End of Yr.	Waste(+) or Deficiency(-)	Annual Flow	In Storage End Of Yr.	Waste(+) or Deficiency(-)	Percent of Mean East & West Walker
1903	226,000	26,000		86,500	0	-53,500	90
4	265,000	91,000		160,000	20,000		122
5	177,000	68,000		97,600	0	-22,400	79
6	417,000	180,000	105,000	226,000	42,000	44,000	155
7	463,000	180,000	283,000	280,000	42,000	140,000	210
8	163,000	163,000		95,500	0	-2,500	80
9	267,000	180,000	60,000	149,000	9,000		120
1910	242,000	180,000	42,000	185,000	42,000	12,000	123
11	330,000	180,000	150,000	279,000	42,000	139,000	187
12	140,000	120,000		101,000	3,000		69
13	132,000	52,000		95,300	0	-41,700	65
14	338,000	180,000	10,000	295,000	42,000	113,000	182
15	201,000	180,000	1,000	126,000	28,000		94
16	250,000	180,000	50,000	219,000	42,000	65,000	135
17	226,000	180,000	26,000	202,000	42,000	62,000	123
18	192,000	172,000		117,000	19,000		89
19	183,000	155,000		103,000	0	-18,000	82
1920	171,000	126,000		112,000	0	-28,000	81
21	225,000	151,000		119,000	0	-21,000	99
22	266,000	180,000	37,000	165,000	25,000		124
23	221,000	180,000	21,000	114,000	0	- 1,000	96
24	67,900	47,900		43,000	0	-97,000	32
25	200,000	47,900		73,300	0	-66,700	79
26	128,000	0	- 24,100	73,100	0	-66,900	[illegible]
27	236,000	36,000		93,600	0	-46,400	[illegible]
28	138,000	0	- 26,000	[illegible]	0	[illegible]	[illegible]
29	109,000	0	- 91,000	[illegible]	0	[illegible]	[illegible]
1930	133,000	0	- 67,000	93,600	0	-46,400	53
31	71,500	0	-128,500	27,500	0	-112,500	21
	215,100			132,700			

Note: Water Requirement taken as annual net demand 180,000 acre feet plus 11% or 20,000 acre feet for losses, or a total of 200,000 acre feet. Reservoir capacity 180,000 acre feet.

Note: Water Requirement taken as annual net demand for lands below Bridgeport, 123,000 acre feet - 17,000 acre feet for losses, or total of 14 ,000 acre feet. Reservoir capacity 42,000 acre feet.

The foregoing tabulations indicate that under full development, there would be waste from upstream development on West Walker River only [illegible] years out of the 31-year period 1903-31; and on East Walker River only [illegible] years. It also appears that there would have been deficiencies for the upstream development on West Walker for [illegible] years, running as high as 8%; and deficiencies on East Walker for [illegible] years, running as high as 80%. It is of course true that only the annual totals of discharge and of demand are used in the foregoing tabulation, and that during some years in which no waste is indicated, there might actually be waste as the result of failure to fully regulate the stream to the extent theoretically possible with the storage capacity available. Taking a year of average flow, however, as a check, we have for 1901 -- which is 99% of normal -- the following monthly distribution of discharge, irrigation demand and storage:

West Walker River - 1921

	Runoff acre feet	Irrigation Demand (200,000)	In Storage (140,000)	Waste (-) or Deficiency (-)	Return Flow Mason Valley
			125,000		
Oct.	5,260		131,260		
Nov.	5,250		136,510		
Dec.	4,110		140,620		
1921					
Jan.	3,890		144,510		
Feb.	5,660		150,170		
Mar.	11,000		161,170		
Apr.	17,600	20,000	158,770		990
May	45,900	36,000	168,670		1,650
June	79,700	41,000	180,000	- 24,370	2,310
July	32,800	44,000	168,800		2,310
Aug.	9,530	40,000	138,330		1,980
Sept.	4,780	18,000	127,110		660
Totals	225,000	200,000		- 24,370	

East Walker River - 1921

	Runoff acre feet	Irrigation Demand (140,000)	In Storage (42,000)	Waste (-) or Deficiency (-)	Return Flow Mason Valley
			2,740		
Oct.	2,740		5,480		
Nov.	2,140		7,620		
Dec.					
1921					
Jan.	2,020		9,640		
Feb.	2,980		12,620		
Mar.	5,840		18,460		
Apr.	9,300	14,000	13,760		1,230
May	24,300	25,200	12,860		2,000
June	42,100	30,800	24,160		2,900
July	17,400	30,800	10,760		2,900
Aug.	5,000	28,000		12,240	1,600
Sept.	2,500	11,200		8,700	250
Totals	119,000	140,000		20,940	10,880

The foregoing tabulation indicates that under full development in an average year, with the irrigated area in Mason Valley divided between the two streams in proportion to mean flow, and with stream flow approximating that of 1921, there would be a deficiency of about 71,000 acre feet in the water-supply from East Walker, and a waste of about 24,000 acre feet from West Walker. Since a large part of the irrigated area in Mason Valley is served by canals diverting below the confluence of East and West Walker Rivers, in actual practice the deficiency presumably would be supplied by storage from West Walker. Also, in some years, though it would not have been possible in 1921, the excess in the supply of one branch could be used to some extent to supply deficiencies in the other.

From the foregoing data it seems reasonable to assume that in average years, with stream flow conditions similar to 1921, and under ultimate development of the valley upstream from the reservation, there might sometimes be available as the result of summer floods about 20,000 acre feet in excess of the reasonable demands or of the control facilities, a part of which should reach the Indian Diversion, if excessive diversions and waste by upstream users can be prevented. As also indicated by the tabulation and as heretofore pointed out, there should be approximately 20,000 acre feet of return flow from Mason Valley that probably could not be utilized except on the reservation. It seems reasonable to assume that under full development, and during years of average stream flow conditions, the only water supply that can be depended upon with any degree of assurance is the return or drainage water from the lower half of Mason Valley. As previously stated these studies - the four preceding tabulations - were prepared on the assumptions of Mr. Stevens as to water requirement, viz: 2 acre feet on the land and 3 acre feet at diversion. The amount actually used on the Newlands Project is 2.8 acre feet on the land and 5.3 acre feet at the diversion.

Water Available for Reservation under Present Conditions.- As shown in Table 2 of Mr. Hodges' report, the quantity of water available in excess of present demands and storage facilities, and under present conditions of development may vary from a minimum of 14,600 to 100,000 acre feet annually (the range in annual runoff since existing storage works were completed) which is inclusive of the 25.21 second feet, or 9,000 acre feet per season recommended by the Special Master.

Proposed Storage Reservoir at Weber Site.- For the purpose of conserving the water - both flood or surplus water as well as

the 25.21 second feet allocated to the reservation by the Master's proposed decree - consideration has been given to the question of developing a small storage reservoir at a minimum of cost, that would answer the present requirements and that would also be useful as an equalizing or auxiliary reservoir in the event the reservation lands are finally awarded a prior right to water for 10,000 acres; or failing in this, that the water supply necessary for this area may be acquired either by purchase or by the development of adequate storage at some other site, such as the Rio Vista site, as covered in previous reports herein referred to, or by participation in the construction of a proposed reservoir at Hoye Canyon as has heretofore been suggested by members and officials of the Walker River Irrigation District. Notwithstanding the conclusions of Consulting Engineer J. C. Stevens to the contrary, it is my judgment that storage of at least 30,000 acre feet will be necessary if 10,000 acres of land on Walker River Reservation is ever to be successfully irrigated. At one stage of the adjudication suit officials of the Walker River Irrigation District offered to enter into an agreement to permit the flood water necessary to fill a 30,000 acre feet reservoir annually, to pass by or through their storage reservoirs.

The topography at the Weber site is such that the site is feasible only for a small reservoir of about 6,000 acre feet capacity. A serious objection to so small a reservoir is the fact that its usefulness will be of comparatively short duration because of the relatively large quantity of sand that is swept down the channel of Walker River. It is proposed to minimize this difficulty by installing sluice gates, but de-silting a reservoir by sluicing is not ordinarily successful.

Based on the data available, consisting principally of topography and test pit and boring records made at the Weber site by Assistant Engineer Beemer in 1918, preliminary plans for three possible reservoir developments of 6,200 acre feet capacity have been prepared. These plans are in outline only, include no details, and were prepared only as a basis for further discussion of the problem, and for determining the probable approximate cost of storage at this site. The adoption of any particular plan should be preceded by further exploration, and examination and study of damsite, as some of the data as to material underlying the damsite appears to be conflicting and questionable.

In addition to the three alternative proposals for the Weber site, an estimate is included for a 10,000 acre feet reservoir at the Rio Vista site, which however is not favored because of the relatively high cost, and because it is believed this site should

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reserved for the 30,000 acre feet reservoir as recommended in a previous report.

The plans considered, and the estimated cost of each follow. Approximate quantities are given on the attached preliminary drawings.

Storage Reservoir of 6200 acre feet at Weber Site.

A. Reinforced Concrete Deck Dam with 250 ft. Spillway Section and 40x30 Radial Sluice Gate, and Canal Headgate, $160,000

B. Reinforced Concrete Deck Dam with 300 ft. Spillway Section 2 C. I. Sluice Gates 8x8, and 6'x6' C. I. Canal Headgate $130,000

C. Earth and Rock Fill Dam, Concrete Outlet thru ridge at right of dam, and Overflow Spillway thru low gap in same ridge $110,000

Reservoir of 10,000 acre feet at Rio Vista

D. A 10,000 acre feet reservoir at Rio Vista (Modification of Plan included in Engle-Blomgren Report) would cost about $200,000

Findings and Conclusions: Based on the foregoing data and assumptions, it appears probable that with Walker River Valley above the reservation fully developed as contemplated, but little water other than return flow will be available for use on the Indian reservation during years of average stream flow.

Under full development, assuming that it will be infeasible for Mason Valley interest to re-divert and use the return flow from the lower half of Mason Valley, it seems reasonable to conclude that during years of average stream flow there may be varying quantities ranging as high as 20,000 acre feet annually returned to the river from this source. That part of this amount occurring during the irrigation season, so long as the flow exceeds the decreed flow recommended by the Special Master, would be inclusive of the decreed quantity.

It seems probable that under full development as contemplated, the return flow will be sufficient to fulfill the decreed flow recommended by the Special Master, 25.21 second feet, except during a few weeks at the beginning of the irrigation season, when it undoubtedly will be necessary for upstream users to augment the supply by direct stream flow.

The quantity of water allocated the reservation in the Master's proposed decree is based on the maximum acreage irrigated at any one time by the Indians,- thus ignoring the fact that this acreage has been restricted by the inadequate water supply, and that had an ample water supply been available a much larger acreage would have been irrigated.

The case is being appealed by the attorneys, and it seems reasonable to expect that a favorable decision will be made by the higher court, inasmuch as all the circumstances are apparently similar to those pertaining to the Pyramid Lake Reservation, where a favorable decision was secured some years ago.

Under conditions as they have existed for many years a storage reservoir on or near the reservation has long been recognized as a practical necessity, but the uncertainty as to water rights, as well as the absence of desirable sites, has made storage development impracticable and infeasible.

It is the conclusion of Consulting Engineer J. C. Stevens that if the government for the Indians be decreed a prior right for water for the irrigation of 10,000 acres as set up in the Bill of Complaint "it will be entirely practicable to supply this quantity" from Walker River without storage. Accepting this conclusion as correct, it would be an unnecessary expenditure of funds to provide storage for irrigating Indian lands in the event the government secures a favorable decision in the case now pending. In this case the water users above the reservation might find it to their interest to construct storage for the Indian lands in order to prevent the considerable conveyance losses that would occur between the Indian diversion point and the next lower diversion on the river.

If the decree as recommended by the Special Master is confirmed by the courts, and such decree is enforced, there will be a continuous flow of 25.21 second feet at the Indian diversion during the irrigation season, but use of this water presumably will be restricted to 2000 acres. Such water in excess of the decreed 25.21 second feet as may reach the reservation during the irrigation season as the result of floods or the return water from up-stream irrigation; and all the water reaching the reservation during the non-irrigation season, will, providing it is conserved for use, presumably be available for irrigating land in addition to the 2000 acres covered by the decree, but in all probability with a priority dating only from the time it is

placed to actual beneficial use.

Considerable quantities of water in excess of the Water's proposed allocation are at times available, but this supply will be decreased as upstream irrigation development is increased.

In view of the obvious certainty of expansion of the irrigated area upstream it seems feasible now only to provide storage for the water that probably will be available after completion of the upstream development.

A small reservoir at or near the diversion point is invaluable for the purpose of regulating the stream flow to the project demand, and this is true whether the water supply is secured wholly from natural flow, or whether it is conveyed down the stream channel from an upstream storage reservoir.

It is the conclusion of many engineers who have studied the Walker River Reservation water supply problem that a small reservoir should now be constructed at the Weber site. Such a reservoir would at times be very effective in conserving the inadequate supply now available, and in the event an adequate water supply should be secured either by a favorable decision in the adjudication suit now pending, or by the acquisition of stored water - either by purchase or development - this small reservoir near the diversion works, would be of value for regulating the supply to the demand and thus eliminate waste. The objection to a small reservoir on the lower Walker River is its comparatively short period of usefulness in consequence of the silt deposit.